

TRIBES, STATES, AND THE EXPLOITATION OF BIRDS: SOME COMPARISONS OF BORNEO AND NEW GUINEA

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ABSTRACT.—Exploitation of birds for trade by tribalists of Borneo and New Guinea are compared. Traditionally, bird products in Borneo passed to overseas markets, but in New Guinea were mainly used locally. Contemporary exploitation is illustrated by case studies of a Punan village in Borneo and a Maring village in Papua New Guinea. The Punan are minimally involved in exploitation and control of birds for markets, these roles having been assumed by outsiders backed by the state. Traditional exploitation of birds persists among the Maring, largely because bird products are unimportant in the national economy.

The comparison indicates alternative consequences of the intrusion of the state for access to and control of biological resources by tribalists. Different forms of incorporation into the state have variable impact on tribalists' ethnobiological systems, including use of resources in exchange. It is therefore appropriate for ethnobiologists to contextualize their studies by reference to contemporary political-economic systems.

RESUMEN.—Se compara en este trabajo la explotación de aves para el comercio por parte de grupos tribales de Borneo y Nueva Guinea. Tradicionalmente, los productos derivados de aves en Borneo pasaban al mercado externo, mientras que en Nueva Guinea eran destinados principalmente al uso local. La explotación contemporánea es ilustrada mediante estudios de caso de una aldea Punan en Borneo y una aldea Maring en Papúa-Nueva Guinea. Los Penan están involucrados en forma mínima en la explotación y control de aves para el mercado, puesto que estas funciones han sido asumidas por personas externas a la comunidad, respaldadas por el estado. La explotación tradicional de aves persiste entre los Maring, debido en buena medida a que los productos de aves no son importantes en la economía nacional.

La comparación indica consecuencias alternativas de la intromisión del estado para el acceso a y control de recursos biológicos por parte de los pueblos tribales. Las diferentes formas de incorporación al estado tienen un impacto variable en los sistemas etnobiológicos de las sociedades tribales, incluyendo el uso de recursos en el intercambio comercial. Es por ello apropiado que los etnobiólogos contextualicen sus estudios en referencia a sistemas político-económicos contemporáneos.

RÉSUMÉ.—Les modes d'exploitation commerciale des oiseaux par les tribues de Bornéo et de Nouvelle Guinée sont comparés. Traditionnellement, les produits oiselliers de Bornéo sont destinés aux marchés d'outre-mer, mais en Nouvelle Guinée, ils sont surtout utilisés localement. L'exploitation moderne de ces produits est illustrée à l'aide d'exemples tirés d'un village Punan de Bornéo et un

village Maring de Papua Nouvelle Guinée. Les Punans s'occupent peu d'exploiter et de contrôler les oiseaux pour le marché, ce rôle ayant été assumé par des personnes de l'extérieur, appuyées par l'état. L'exploitation traditionnelle des oiseaux persiste parmi les Marings, largement parce que les produits oiselliers ne forment pas une partie importante de l'économie nationale.

Les résultats de ces comparaisons indiquent des conséquences variables suivant l'intrusion de l'état concernant l'accès et le contrôle des ressources biologiques par les tribues. Les différents moyens d'incorporation au sein de l'état agissent de façon différente sur les systèmes ethnobiologiques des tribues, y compris l'utilisation des ressources pour l'échange. Il est donc recommandé aux ethnobiologistes de contextualiser leurs recherches au sein des systèmes politico-économiques contemporains.

INTRODUCTION

An important dimension of ethnobiological studies is the documentation of how biological resources are culturally utilized. Aspects of use include—but by no means exclusively so—processes of cultural appropriation from nature, and of the redistribution of these resources in exchange systems. One very important use to which biological resources have long been put is as objects of trade. It has been by trading local products that many pre-industrial communities linked themselves into a larger economic and socio-political order.

There has been a fruitful convergence of interest of ethnobiologists and human ecologists, particularly in relation to aspects of production and management of biological resources (e.g., Conklin 1957; Ellen 1983). A comparable convergence between ethnobiology and economic anthropology is yet to emerge. This is somewhat surprising, given the common interests of both economic and ecological anthropologists in systems of production and distribution, including indigenous conceptions of the processes. The incorporation of tribal communities into encompassing political-economic systems has clearly had a profound impact upon the nature of systems of production and their sustaining systems of indigenous knowledge.

In this paper I take up some of these issues through a comparison of two adjacent parts of the tribal world, and their different histories as suppliers of forest products, especially birds, to an international market. In particular, I am concerned with how the different trajectories of incorporation into a world-system resulted in different consequences for the continuing involvement of tribal communities in the exploitation and management of wild bird resources.

Ethnobiology embraces a complex of knowledge and practice. It does not, however, constitute a "system" in itself, except as an analytic abstraction. Rather, ethnobiology is composed of elements of diverse aspects of socio-cultural systems, including the ecological, economic, ideological, and cosmological. As such, any ethnobiological study should endeavor to indicate the relation of the particular focus of study to the wider socio-cultural context within which ethnobiological data are embedded.

In this paper I am not concerned with the "content" and internal order of ethnobiological lore—the traditional focus of studies in ethnobiology, whether as knowledge of taxonomies, or practical, medicinal, magical, or ritual properties

and uses of organisms. Rather, I focus on how biological resources come to assume a structural role in mediating the impact of the state on tribal, trading populations. Clearly, biological resources become transformed into tradeable commodities through the application of specific ethnobiological knowledge and practice. However, I am concerned here more with the consequences of this transformation than its organization and form.

It is the intention of this paper, then, to develop some comments on how political-economic "world systems" might be conceived as impinging on traditional systems of ethnobiological knowledge and practice. The emphasis is on the socio-cultural procurement practices and systems of redistribution of harvested biological resources. Ultimately, this discussion might lead to a theoretical convergence between anthropological studies of political economy and ethnobiology, as has already occurred in the fields of human ecology and ethnobiology.

For millenia indigenous tribal people have sent the natural productions of their lands afar in trade and tribute. Subsistence economies of tribal communities were, to a greater or lesser extent, geared to the surplus production of commodities that were in high demand by complex, state societies. Many of these goods were of little or no intrinsic value to those who produced them, other than for what useful or luxury items might be obtained in exchange. The range of products of tribal lands in demand by settled societies is legion, but has included the fine furs and pelts of animals, feathers, ivory, aromatic gums, fine woods, perfumes, spices, pigments, narcotics, and a bewildering variety of animal and plant products deemed to have medicinal or magical properties.

In many parts of the globe, relations of mutual dependence rather than open exploitation characterized the political-economic relations between precapitalist trading states and the tribal communities on their peripheries. With the expansion of a capitalist world system, however, the relation of traditional communities to their natural resource base has become radically transformed. Many natural resources have lost their traditional value and been superceded or replaced by industrial manufactures, and, of course, by money. In many instances, those that retain value have become subject to commercial production processes that effectively deny the continuation of traditional forms of association with the resources and their management.

It is conventional to regard the process of the incorporation of indigenous people into the global economy as involving the commoditization of resources—whether natural resources or human labor—which facilitates and encourages their exploitation and sale on an individualistic basis. In this process of commoditization, indigenous people have frequently lost socio-political autonomy and privileged access to resources which formerly characterized subsistence strategies (e.g., Nietschmann 1973).

Two regions where these processes are relatively recent are the great equatorial islands of Borneo and New Guinea. Both islands have long been the source of certain luxury goods, extracted from the forests by tribal communities, that have been important in international trade. In both areas, the influence of Southeast Asian precapitalist states was weak, virtually nonexistent in most of New Guinea west of the Vogelkop (Birdshead) Peninsula. Similarly, effective control by European colonial powers came relatively late.

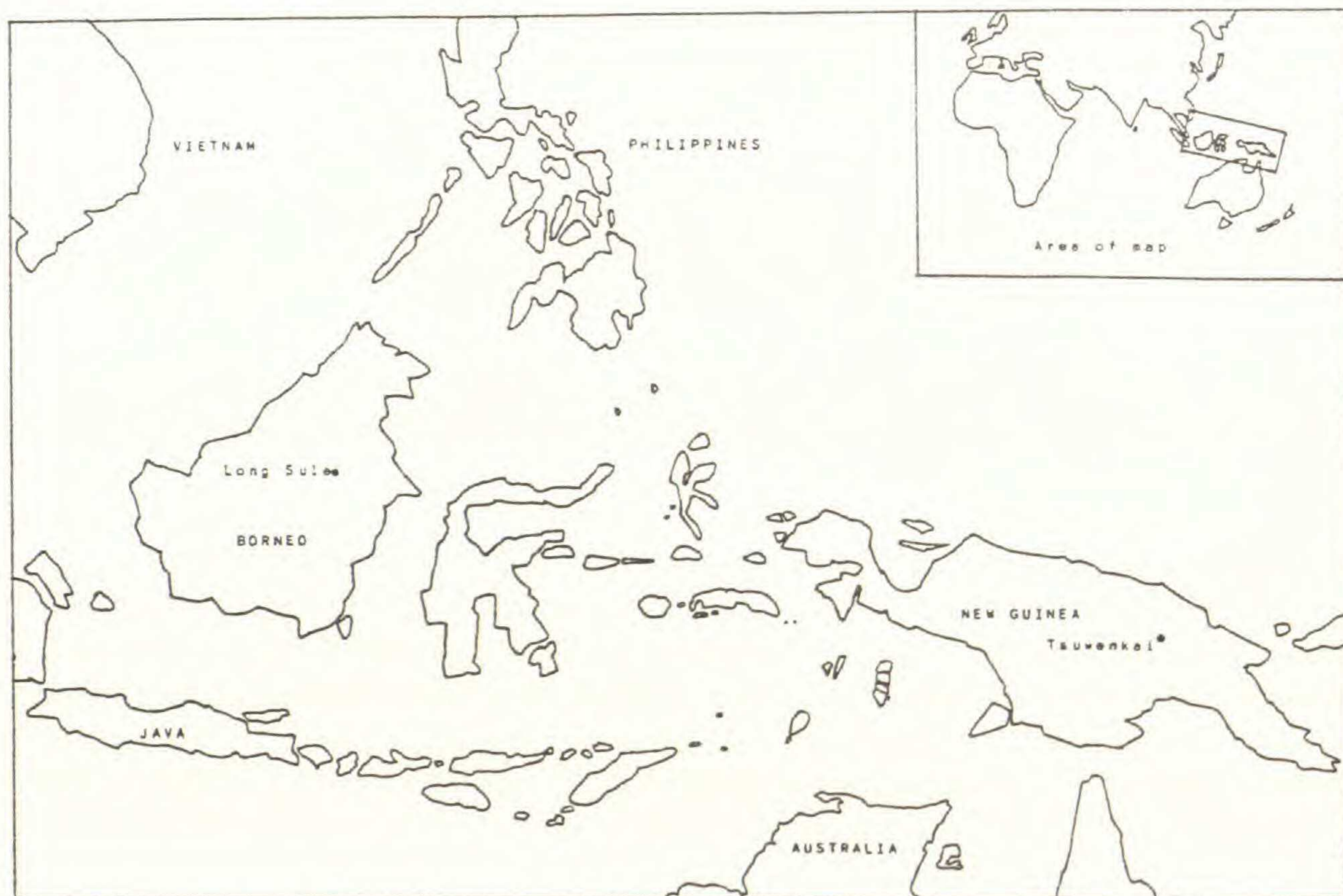


FIGURE 1.—Location of case studies.

This paper, then, examines aspects of traditional exploitation of forest resources in New Guinea and Borneo, and certain recent transformations in the context of colonial and postcolonial developments. The emphasis is on the articulation of the production of jungle goods, especially derived from birds, with systems of exchange, with particular attention to trade. The discussion is based primarily on my own research in New Guinea on the hunting of birds and trade in plumes (e.g., Healey 1980, 1990), and on the literature dealing with forest products in Borneo, but also includes some preliminary comparative remarks on a brief field trip to Indonesian Borneo.

BORNEO AND NEW GUINEA

The large tropical islands of New Guinea and Borneo (Fig. 1) lie either side of the Wallace Line, and exhibit a comparable diversity of flora and fauna (Beehler et al. 1986; Flannery 1990; Medway 1977; Smythies 1981). The richness of biological resources in both islands is paralleled by considerable ecological and cultural diversity that reaches its greatest elaboration in New Guinea.

Forest resources are of material and ideological significance in the indigenous cultures of both islands, and have long been major items in extensive trading networks. The bulk of these goods are luxury items rather than staple foods. Trading networks developed to serve the demands of indigenous tribal groups for access to valuables that were deployed in local economies of competitive display or consumption. In many areas, however, trade networks filtered the products of the far interior to small coastal centers from where they entered the

international passage of luxury and exotic goods serving the Far East, the Middle East, and Western Europe.

The traditional societies of both islands can be broadly treated as small-scale tribal formations, mostly egalitarian and decentralized, although some central Borneo societies were stratified. The scale of socio-political units was highly variable, however, from a few score individuals to several thousands.

Subsistence for the most part was based upon shifting cultivation—of dry rice in Borneo and tubers in New Guinea. Hunting and gathering were also important, to the extent that there were specialist forest dwellers in both islands practicing little or no agriculture. Most depended on sago palm for the carbohydrate component of the diet, and were therefore principally confined to lower altitudes.

One major difference between the two islands must be noted: centralized Malay states have been present in Borneo, mostly in coastal regions, since about the fourth century AD. It is through these states that interior tribes were linked to the outside world.

Although there were no truly isolated, self-contained communities in New Guinea prior to the colonial era, contact with the outside world was at most tenuous, sporadic, and confined to the coastal belt in western and north-coastal New Guinea. Indeed, the Sultanate of Tidore in the Moluccas claimed suzerainty over the Western Papuan Isles and much of the Vogelkop Peninsula of what is now Irian Jaya, although its actual economic and political control was probably nominal (de Clercq 1889).

In both islands, exploitation of forest resources served local demands for wild foods, building materials, magical and medicinal items, and valuable items of decoration on ceremonial occasions. Certain forest products were also traded widely. However, in each island, the ecological and social organization of trade was quite different, and this has led to a markedly different impact of the global economy in different areas.

TRADITIONAL TRADE IN FOREST PRODUCTS

The patterns of precolonial trade are quite different in the two islands¹, and this is largely because of their respective connections to larger, international networks of trade.

Borneo was long an important source of jungle produce for international markets, especially in mainland Southeast Asia and China. Principal forest products passed in this trade were edible birds' nests, rattans, aromatic and decorative woods, camphor, gums, rhinoceros horn, "ivory" from the hornbill bird, and bezoar stones. The bulk of these goods were produced by tribal agriculturalists of the interior—the various so-called Dayak tribes—and specialist foragers, the forest nomads such as the Punan. Substantial proportions of these goods were exported to mainland Southeast Asia and China. Most of this export trade was controlled by elites of the various Malay sultanates dotted along the coastal belt at river mouths. Goods flowing in return for forest products were Indian and Indo-Chinese luxury items for consumption by coastal elites, as well as Indian textiles, Indo-Chinese brassware and porcelain, and salt for exchange with interior tribal

people (e.g., Brown 1970; Dahlan 1975; Freeman 1970; Healey 1985b; King 1993; Metcalf 1982; Rousseau 1989).

Unequal terms of trade operating between the Malay population of the coastal belt and tribal communities of the interior favored down-river communities that could manipulate the supply of trade goods into the interior by control of river mouths. Coastal states were unstable polities, lacking structurally secure central authority. Their territories were generally poorly defined, and consisted of personal hereditary domains of the nobility interspersed with domains vested in the control of the sultan and his appointed officials.

The decentralized structure of the state, coupled with the revenue-raising powers of domain-holders, was a critical source of instability of sultanates, with fractious noblemen and vassal states occasionally seeking to assert their independence from the sultan and establish themselves as rival, autonomous polities.

Struggles for power within states led to escalating demands for jungle products as a means of raising revenue to underwrite a sumptuous life-style, and to engage armed retainers (effectively pirates) to harrass the settlements and shipping of competitors. As a consequence, interior tribal producers of jungle products were subject to periodic increasing demands for more produce and attempts to undermine their political and economic autonomy (Healey 1985b).

It is important to note that interior tribal people appear to have had an awareness of the basic structure of the larger trade system in which they were embedded. This is indicated by population movements which were sometimes motivated by a desire to escape from disadvantageous trade relations with down-river agents of coastal states, or to gain easier access to other sources of exotic valuables. The ultimate result was the consolidation of structural instability of state systems, and of the mutually interdependent relation between tribes and states, that was historically reflected in the rise and fall of particular dynasties and states in the coastal belt, and in flurries of war, headhunting, and large-scale migrations of tribal people in the interior (Healey 1985b; Rousseau 1989). But ultimately, the position of states and tribal populations in a large system of political-economic relations ramifying out of the Far East and South Asia was crucially dependent upon the capacity of interior tribal groups to exploit forest resources.

An integral aspect of this exploitation was the knowledge base itself. This was continually under potential threat through the tendency of coastal states to incorporate autonomous tribes of shifting cultivators and hunter-gatherers into the state as dependent communities. This process tended to take the form of conversion to Islam and the adoption of sedentary agriculture.

Similar processes continue today, under Indonesian government schemes encouraging re-settlement of communities at selected sites along major rivers. One might suggest that a consequence of such forms of incorporation into the state—premodern and modern—is an attenuation of the forms of attachment to, and exploitation of, forest resources by tribal groups, and an ultimate erosion of the traditional knowledge base upon which that exploitation rests. This is of minor consequence for the modern state, given that the primary sources of revenue in Borneo are oil, natural gas, coal, and timber products in capital-intensive industrial systems. Indeed, the current oil and timber boom in East Kalimantan

makes it one of the richest of Indonesia's 26 provinces (Pangestu 1989) although annual incomes of the great bulk of the population are extremely low. But while heavy extractive industry has supplanted the importance of jungle products as a source of state revenue, the collection of jungle produce is still an important source of income for more isolated rural dwellers (Jessup and Peluso 1986).

The structure of trade in New Guinea was traditionally quite different from Borneo. In the precolonial period marine shells penetrated far into the interior, but for the most part, there was not the island-wide pattern of trade that may be discerned in Borneo. Compared to Borneo, the vast majority of trade goods were distributed over comparatively short distances, and the individual links between transactors were typically very short—at least on the mainland—often no more than 20 km at most (Healey 1980, 1990; Hughes 1977). But then, the known social and geographic world in the interior of New Guinea was itself typically very small. Nothing like the extensive journeyings that occurred in Borneo has been reported for mainland New Guinea.

On the mainland a bewildering variety of artifacts, live domestic and wild animals, marine shells, bird plumes, mammal skins, crops, and other material objects, besides magical and ritual substances and knowledge, was passed in both barter and ceremonial exchange. The landscape was criss-crossed with complex, interlocking networks of exchange of material objects, but there were no large-scale, island-wide patterns of trade. Rather, there were a plethora of smaller, interlocking "systems" of trade, each with a rather different catalogue of goods involved.

Unlike Borneo, New Guinea was never directly incorporated as a major supplier of forest products (or other goods) into major maritime trading spheres centered on precapitalist state systems. It is true that parts of western New Guinea were a major source of forest and marine products entering the Southeast Asian trading system, but the direct influence of traders and the agents of the Tidore sultanate seems to have been very limited (Hughes 1977).

Nonetheless, the New Guinea mainland was the principal source of one forest product that excited Southeast Asian merchants and noblemen from early times: Bird of Paradise skins. The principal sources of these were concentrated in the Aru Islands, the Vogelkop, and nearby islands (Healey 1980). It is unlikely that extensive trade networks penetrated far inland prior to colonization. By the time Europeans became interested in the plume trade as a major commercial operation around the turn of the last century, they generally took over all aspects of production, becoming hunters themselves, or supplying local people with guns and ammunition, as well as managing the export of plumes (e.g., Doughty 1975; Gilliard 1969). Traditional patterns of production and supply were therefore only minimally incorporated into the large-scale commercial exploitation of the birds centered upon the European millinery industry.

Nonetheless, bird plumes were probably the only item, other than marine shells, that ever enjoyed a widespread usage in the interior, and which were traded over an extensive area focussed on the central highland valleys of the eastern half of the island (modern Papua New Guinea) (Healey 1980). In essence, trade in plumes in this region converged on a comparatively small central area of densely populated highland valleys that "consume" large volumes of plumes as

decorations and valuables, but which lacked direct access to adequate supplies because of extensive deforestation. Goods sent in exchange for plumes varied according to sector, but included marine shells, pigs, stone tools, salt, and various artifacts.

Patterns of trade in such goods of localized provenance as stone tools, salt, and mineral pigments tended to radiate from the source areas, often on intersecting paths. But dominating patterns of trade in many inland regions were often defined by the flow of shells and plumes towards limited central areas of high consumption. In that sense, trade patterns within New Guinea, to the extent that we can reasonably refer to distinctive general orientations, tended to be directed towards an internal "sink," rather than diverging towards overseas consumers, as in Borneo. To a large extent I think this can be attributed to the lack of a long-established demand for the products of New Guinea overseas, and the attendant minimal development of trading networks beyond the region.

But, as in Borneo, trade in New Guinea continued into modern times. While some trade networks suffered substantial decline, especially in island regions (e.g., Harding 1967), others saw considerable growth in terms of the inclusion of new items of value, volumes of goods in circulation, velocities of passage of goods, and geographic scope of trade links (e.g., Healey 1990). Much trade that has persisted into the present remains essentially precapitalist in its organization. Although money is now widely used in trade, it has frequently been incorporated as a valuable rather than as a currency. Thus, the presence of money in trade does not amount to monetization, if the *currency* aspect of money is suppressed (Healey 1985a). Transformations that have occurred in trade systems in New Guinea are not simply the effect of the penetration of a money economy. Indeed, in New Guinea, some exchange systems have shown a capacity to absorb both cash and western commodities leading to an efflorescence of exchange (Gregory 1982; Healey 1990).

One factor that insulated traditional trade from monetization was the fact that inland trade networks were not important in the delivery of specialist forest or other goods to international trade systems. New Guinea forest products were essentially of little commercial value to the outside world, except in small amounts for the curio market, and international trade never depended upon traditional trade for its supply.

With a lack of pre-existing networks and infrastructure, the commercial, village-based exploitation of forest products has never significantly developed in New Guinea, nor has traditional trade in forest products served as a source of government revenue. By contrast, the exploitation of forest products has become a significant source of cash income for villagers and others in Borneo. In short, the history of commercialization of forest products and penetration of a cash economy has been different in the two islands.

CONTEMPORARY EXPLOITATION OF FOREST PRODUCTS

Here I present two brief cases of village-based exploitation of forest resources. This exploitation and its significance for villagers must be considered in its legal context. In Papua New Guinea customary tenure is recognised in national law,

together with customary rights of access to forest resources. This contrasts with the situation in Indonesia, where ownership rights to forest land and its products are vested in the national government, which ostensibly regulates trade in such valuable forest products as birds' nests by registering traders and imposing a tax on sales.

Jessup and Peluso (1986) have discussed the ecology of production of forest products in Indonesian East Kalimantan. They conclude that given the legal constraints on ownership of resources imposed by the state, the intrusion of outside collectors, poachers, and smugglers, and the poor regulation of the market by the state, local communities are unable to manage effectively their communally-held forest resources. The high value of birds' nests encourages state control as a source of revenue, and also raiding of nesting caves by outsiders, and has resulted in overharvesting in East Kalimantan (Jessup and Peluso 1986: 524).

The impact of outsiders in the exploitation of minor forest products in Kalimantan is illustrated by the case of the village of Long Sule, which in many respects encapsulates much of the past and contemporary progress of "development" in Indonesian Borneo. The village is located in Kecamatan (subdistrict) Kayan Hilir, Kabupaten (district) Bulungan, on the banks of the Kayan Iut River, a southern tributary of the upper reaches of the Kayan River. Because of the rugged terrain the area has so far escaped the ravages of the timber industry.

Long Sule is a small village of about 300 people. It is one of three small villages clustered together in the middle of a virtually uninhabited stretch of hill-forest. Although it is some five days' walk to the next nearest permanent habitation Long Sule is readily accessible to the outside world, as a small mission-maintained airstrip is adjacent to the village.

Most of residents of Long Sule and its neighboring villages are ethnically Punan Aput, who were formerly forest nomads in the area. Sedentarization of nomads has a long history in Borneo (Sellato 1989) although the Indonesian government has hastened the process in recent decades in an attempt to consolidate control over interior tribalists.

In common with other forest nomads, the Punan Aput maintained, and indeed still do, important trading relations with stratified sedentary neighbors (Hoffman 1986; Sellato 1989), in this case the Kenyah. In particular, the Punan Aput are renowned locally for their fine rattan weaving. At Long Sule the Punan adopted Kenyah rice cultivation technology, as well as other cultural traits, notably certain styles of dress, Hornbill-dance ritual, and various visual art motifs. The village, however, is not self-sufficient in rice, with the granaries exhausted after five or six months. Thereafter villagers depend upon subsidiary garden crops such as bananas, cassava, and taro. Traditional collection of wild sago and other food gathered from the forest, as well as hunting with blow-pipe and spear, and fishing remain important components of the subsistence economy. However, much rice is also purchased from the three local stores in the village. This rice is flown in by light aircraft, and derives from the surplus production of Kenyah agriculturalists elsewhere in Kalimantan. Outsiders as traders are thus an integral element of the village, providing both food and other commodities sold in small stores in the village to help meet Punan subsistence needs, and a source of limited income.

Besides non-Punan (Bugis and Kenyah) store keepers, there are other outsiders resident in the village. These include several Kenyah men engaged in farming and collecting of forest products for the market, a pastor, and a school teacher and their families, and a group of Javanese alluvial gold workers. Long Sule is thus a small multiethnic community. Outsiders are mostly attracted by economic opportunities, and as providers of both goods and income are crucial to the very limited engagement of the Punan in the cash economy.

There are no local cash crops, and the Punan are minimally involved in the collection of birds' nests or aromatic *garu* woods. Both are found locally, though bird nesting caves are several days' walk away. The Punan gain meager supplies of cash primarily through the sale of finely woven rattan bags and other handicrafts to Kenyah and Bugis traders in the village, and by working as casual labor for Javanese gold prospectors.

Despite the proximity of the airstrip, the Punan of Long Sule seldom travel, lacking the cause or financial means to do so. The airstrip is, however, a crucial factor in the current organization of the village, for it enables visits by officials of the government, the mission, and commercial interests such as geologists. It also facilitates the resupply of stores and the import of an impressive array of modern technology: generators, radio and television receivers controlled by store holders, as well as various items owned by Punan families such as a few outboard motors for canoes and children's tricycles. Such possessions are evidence of the capacity of at least some households to amass quite considerable sums of cash despite the lack of local opportunities.

Traditionally, the local Punan did not harvest birds' nests or *garu* wood. Despite their value, and comparative ease of transporting these products to coastal markets, they still do not harvest them, leaving such exploitation entirely to Bugis and Kenyah traders. While Punan knowledge of the forest and skills as blowpipe hunters and gatherers remain an integral aspect of their subsistence utilization of the forest, they appear to have relinquished any possible collective control over, and management of, commercially valuable forest resources other than rattans for weaving.

Arguably, it is the indirect intrusion of the state, which has encouraged and attempted to regulate trade in forest products, that has attracted outsiders to the village as commercial collectors, and inhibited the entry of the Punan into the trade and their potential role as managers of the resources. The scale and extent of the penetration of external commercial interests into this small village far from markets is striking.

The situation in the Papua New Guinea village of Tsuwenkai is quite different. Though comparably isolated, the Kundagai Maring of Tsuwenkai have perhaps had more experience of the wider world. On the other hand, they retain customary control over their own lands, and outsiders—invariably mission personnel—are rarely resident in the village.

Tsuwenkai is located at about 1600 m above sea level on the flanks of the western Bismarck Range in the Jimi Valley, Western Highlands Province. One of over 20 Maring-speaking villages, Tsuwenkai is a community of about 300 people. Self-sufficient horticulture is the mainstay of the local economy. Most households earn modest income from smallholder production of coffee and occasional migrant

labor. Money is now regarded as essential to meet demands of bridewealth and other ceremonial exchanges, and to purchase small luxuries and household comforts, but it is not necessary for mere subsistence, as in Long Sule. Investment in items of industrial manufacture beyond simple hand tools, basic kitchen equipment, and small household luxuries like radios and tape recorders is virtually nonexistent.

Kundagai territory in Tsuwenkai includes extensive tracts of high altitude primary forest, harboring several species of birds widely valued in much of the highlands, including various Birds of Paradise. The Kundagai have long been significant producers of plumes for trade towards central highlands consumers. Case history material indicates increasing export of plumes to the central highlands since just before first contact with the colonial administration in the mid-1950s. Until the 1980s little of this trade was directly with central highlanders, but rather over shorter links with trading partners in more nearby communities.

In the two decades after initial contact the rate of trade in plumes increased considerably. This intensification of trade was sustained by an increase in the importation of plumes from more peripheral areas which were then passed on to ultimate consumers, rather than by increasing hunting locally. Local hunting, however, is important in augmenting the supply of plumes, and ensures that the Kundagai are able to export greater volumes of plumes than they import.

Levels of hunting are regulated by a combination of social, technical, and ideological factors:

- (1) individual and collective property rights, by which only members of the local community may hunt plume-bearing birds, and by which individuals may lay claim to exclusive hunting rights at particular sites, such as Bird of Paradise display trees, hunting blinds, fruiting trees, and so on;

- (2) explicit conservatory practices, in which hunters refrain from killing all male Birds of Paradise visiting a communal display site, or frequenting a particular tract of forest, and voluntarily limit their hunting of female and immature birds;

- (3) beliefs that spirits are angered if hunters kill too much game. Just what amounts to "too much" is, however, equivocal, as the Kundagai also believe that unusual success is a sign of the favor of the spirits. Such beliefs are thus of dubious import in limiting hunting. However, dietary taboos may have some significance. These apply to only some game—mostly mammals prized for their flesh—but make hunting generally less appealing to those subject to taboos. However, the eradication of warfare has resulted in most taboos assumed by warriors falling into abeyance, while Christianization has further eroded traditional taboos.

- (4) the restriction of hunting to simple technology and traditional techniques. Keen hunters display a detailed knowledge of the forest, much of it based upon personal experience. Their success in a hunting expedition is frequently limited by technical means of securing prey, rather than in their skills in locating it. The Kundagai own no shotguns, depending mainly on bows and arrows, traps, and improvised weapons.

Although property rights, voluntary restraints, and technological factors limit hunting pressure with beneficial consequences for the conservation of game, it is not necessarily the case that the consequences are intended by the Kundagai.

It is clear that on the basis of their extensive biological lore many Kundagai are conscious of the need to restrain hunting rates. It is another matter, however, to suggest that this appreciation alone, by individuals, is sufficient to have an effect upon levels of hunting by the community at large. Rather, I would suggest that what ultimately limits Kundagai hunting of plume-bearing birds is the cultural ideal of equivalence and equality in exchange. This ideal inhibits the emergence of competitive and incremental exchange, and separates status from prowess in exchange. As such, trade is not a means for the accumulation of material goods or the generation of profit, and individual's participation in trade can be sustained adequately by only modest involvement in hunting.

Should trade become commercialized, however, inherent restraints on hunting pressure would be seriously modified, to the possible detriment of the capacity of the Kundagai to maintain a sustained harvest of plumes. In fact, by the mid-1980s, trade was increasingly monetized, and the traditional scale of customary exchange rates for different goods had given way to vigorous bargaining over price between some traders. Contrary to the situation elsewhere in Papua New Guinea, this did not result in increased hunting of birds as a means of earning money. The reason lies in the fact that central highlanders' demand for plumes from the Kundagai declined dramatically in the 1980s. Plumes have largely been replaced by money and other goods in ceremonial payments, and the occasions for traditional ceremonies requiring plumes as decorations greatly diminished. Central highlands traders no longer come as purchasers of plumes, but as sellers of pigs. Increasingly, they demand cash for pigs in their efforts to accumulate money for bridewealth and other payments. The Kundagai themselves were constrained to accede to these changing demands in trade in order to maintain their own high demand for pigs for re-deployment in life-crisis prestations.

In essence, the declining demand for plumes in the central highlands and the growing emphasis on cash in exchange are symptomatic of the social and cultural transformations in the central highlands wrought by the intrusion and consolidation of the modern state. The political economy of the modern capitalist state in Papua New Guinea has rendered certain traditional objects, such as bird plumes, redundant to the social order. As such, it has ultimately undermined traditional trade where the objects of trade have no significant commercial value in national and international systems of exchange. This does not mean, of course, that hunting is of no consequence in communities like Tsuwenkai. It is still a means of provisioning local demand for plumes and meat, and as a pleasurable pursuit in itself for the enthusiast.

CONCLUSION

The comparison of the exploitation of biological resources of the forest in Borneo and New Guinea indicate alternative consequences of the intrusion of the state. The incorporation of traditional, subsistence-oriented people as dependent communities within the wider political-economic structures of the modern na-

tion-state does not lead to an inevitable commercialization and overexploitation of forest resources. This is a likely outcome where traditionally exploited forest products continue to have value in wider national or international systems of exchange, or acquire such value. This occurred in Borneo. On the other hand, in at least some parts of New Guinea, the intrusion of the state led to the modification, even collapse of traditional trade and associated systems of production.

This has been to the detriment of some communities, such as the Kundagai, who are now enmeshed in an impoverished position as suppliers of cash to comparatively wealthy pig-providers of the central highlands who no longer desire Kundagai plumes. On the other hand, it has arguably meant that the traditionally exploited biological resource base has enjoyed a measure of protection it might have otherwise lacked.

In both examples of the impact of the state on the relation of subsistence-oriented communities to their forest resources we have seen significant changes in patterns of exploitation. The Punan of Long Sule abandoned a nomadic foraging lifestyle, adopting shifting agriculture and a more-or-less settled residence pattern. This amounts to a radical modification of their traditional relation with the forest though I do not know if this involved any substantial change in their ethnobiological knowledge base.

Similarly, the collapse of the plume trade for the Kundagai has meant that hunting of plume-bearing birds is of little consequence as a specialist activity. In itself, this does not inhibit hunting, but it may well result in a shift in the focus of the hunt, for example, from plumes to meat.

In both cases we can observe changing patterns in the exploitation of biological resources. I suggest that this is liable to have consequences for the ethnobiological knowledge base itself, where that knowledge is significantly shaped by experience. For example, changing patterns of interactions with the environment, as a consequence of the impact of the state, may lead to progressive loss of certain traditional skills, such as hunting, or a selective withering of the traditional knowledge base². So far this does not appear to have occurred among younger generations of the Kundagai. Incorporation into the modern state and a global economy have not yet resulted in a marked erosion of ethnobiological knowledge.

However, a critical implication of the cases reviewed in this paper is that the particular forms taken by incorporation may have differential impact on systems of ethnobiological knowledge. These systems may be cognitively ordered in modified forms. But we should not simply expect an inevitable impoverishment of the traditional ethnobiological systems. What I am therefore suggesting is that it is appropriate for ethnobiologists to contextualize their studies carefully by reference to the political-economic constraints represented by the modern global economy. In this way, the points of conflict and transformation between traditional systems of ethnobiological knowledge and intrusive alternative systems of knowledge may be more readily identified, rather than assumed. At the theoretical level this may lead to further efforts to strike some accommodation and convergence between ethnoscience, human ecology, and political economy within the holistic framework of anthropological discourse.

NOTES

¹What is meant by "precolonial" varies. Much of Borneo was not strictly colonized, although it fell under nominal control of Dutch and British protectorates from the mid nineteenth century. New Guinea was initially carved up among Dutch, German, and British interests in the late nineteenth century. Australia assumed control of the eastern half of the main island and its archipelagoes until the independence of Papua New Guinea in 1975. The former Dutch possessions in the west became the Indonesian Province of Irian Jaya in 1963.

²See Dwyer (1974) for an example of the loss of hunting skills and associated knowledge among younger generations of the Rofaifo of the New Guinea highlands.

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